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# The Academic Research library and Science Education: A Roadmap for the Journey

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Image courtesy of Kyle James

# The Academic Research Library and Science Education:

## A Roadmap for the Journey

Sue Ann Gardner

2017.05.10

# ROADMAP

Science LIBRARIES

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Science INQUIRY

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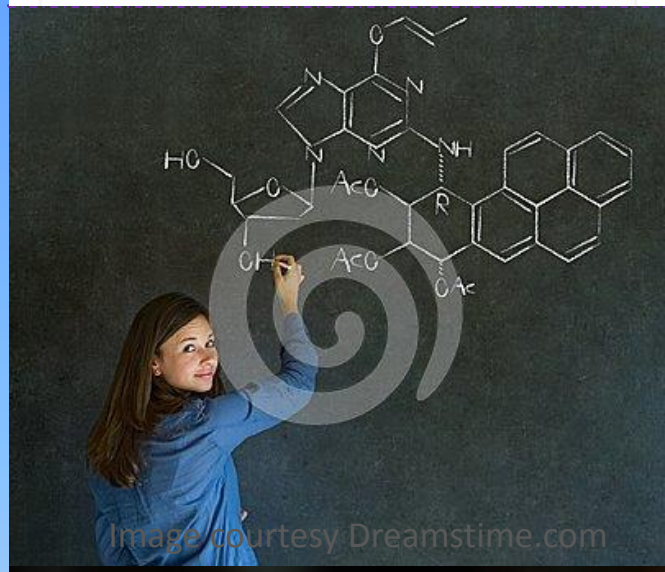
Science EDUCATION

$$e^{i\pi} + 1 = 0$$





# ROADMAP

Students and Faculty

+

Collections

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Academic Library


Image courtesy of University of Split


Image courtesy of Media Grid


Image courtesy of Edinburgh University Library


Image courtesy of Maynooth Library

# SCIENCE LIBRARIES

- Combine traditional and emerging **service** models and infrastructure to promote effective learning
- Provide access to a wide array of **materials** for in depth single subject and cross-disciplinary research
- Incorporate appropriate **technology**
- Offer ample ergonomic **workspaces**

# Science Collections and Services

- In person and remote reference service
- Instruction
- Research assistance
- Digital access
- Hard copy materials / Document delivery
- Databases and indexes
- Clientele: Students, faculty, staff, the public
- User competencies: Remedial to advanced

# The Science Commons

- Varied work spaces:
  - Collaborative spaces
  - Solitary spaces
- Encourages innovation and creativity
- Facilitates situated and active learning
- Promotes communities of practice

# Price Science Commons

# SCIENCE INQUIRY

National Science Education Standards definition:

The diverse ways in which **scientists** study the natural world and propose explanations based on the evidence derived from their work.

Refers also to the activities through which **students** develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world.

Source http://static.nsta.org/pdfs/PositionStatement_ScientificInquiry.pdf

# SCIENCE INQUIRY looks like…

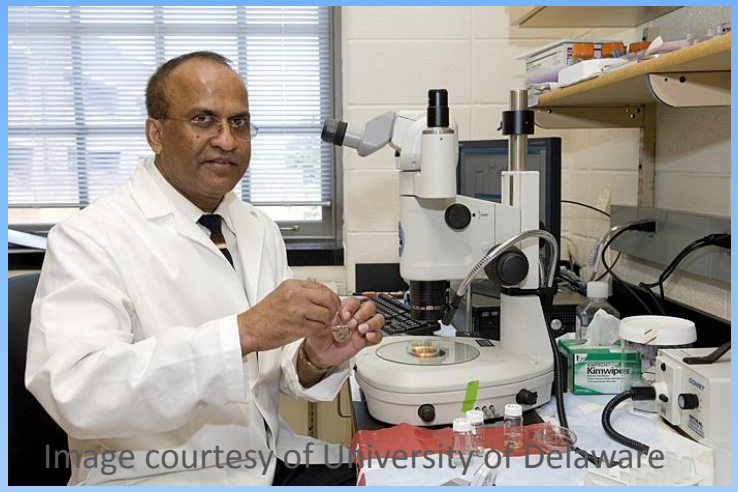


Image courtesy of University of Delaware


Image courtesy of Oregon Institute of Marine Biology


Image courtesy of Slate.com

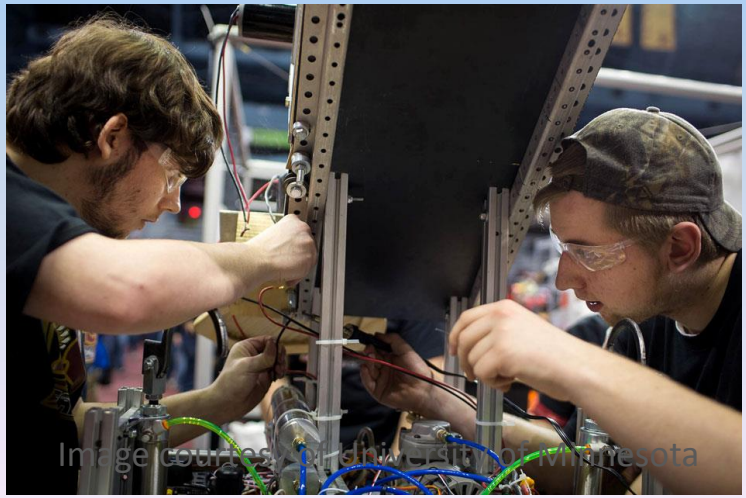
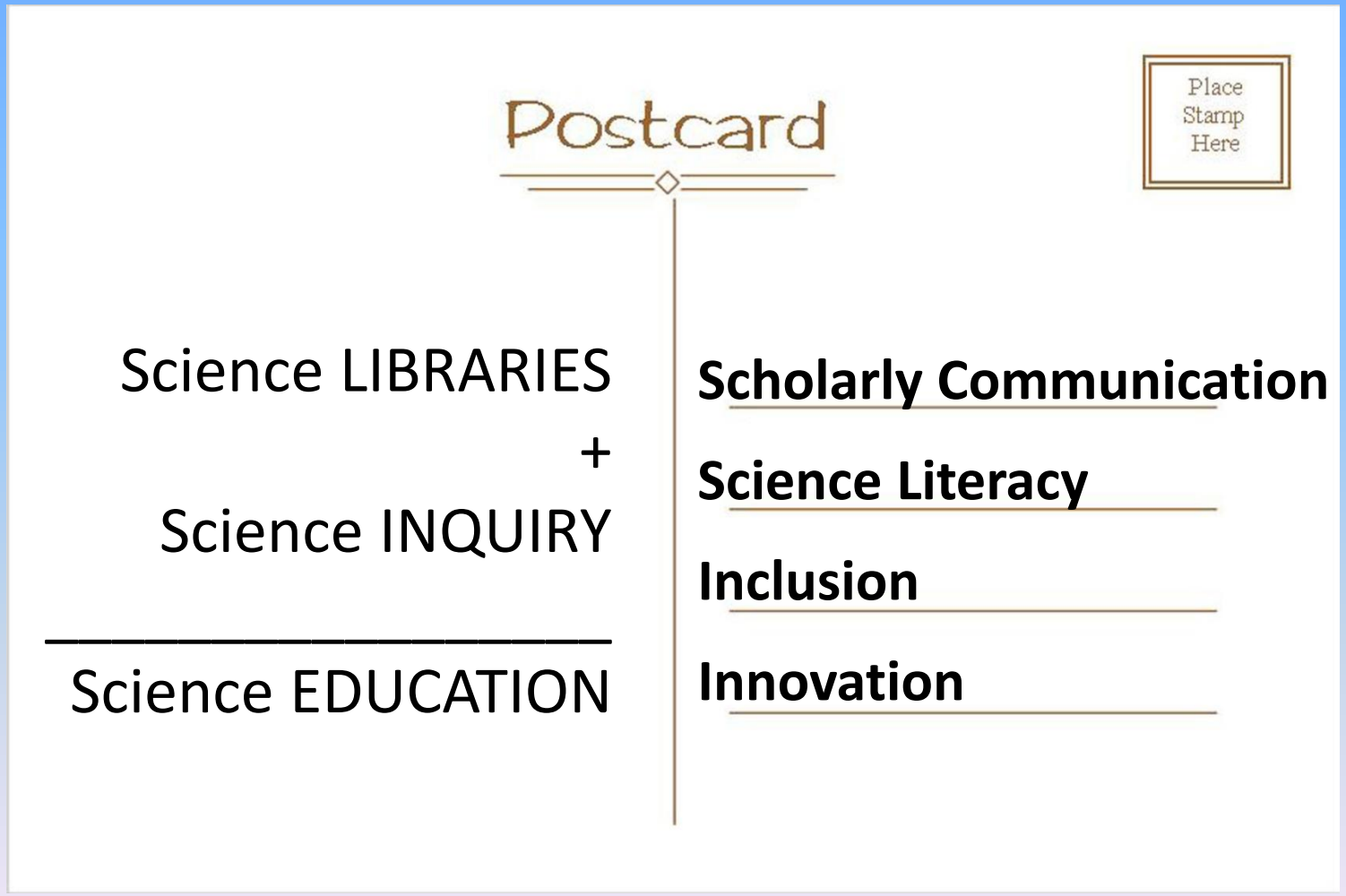
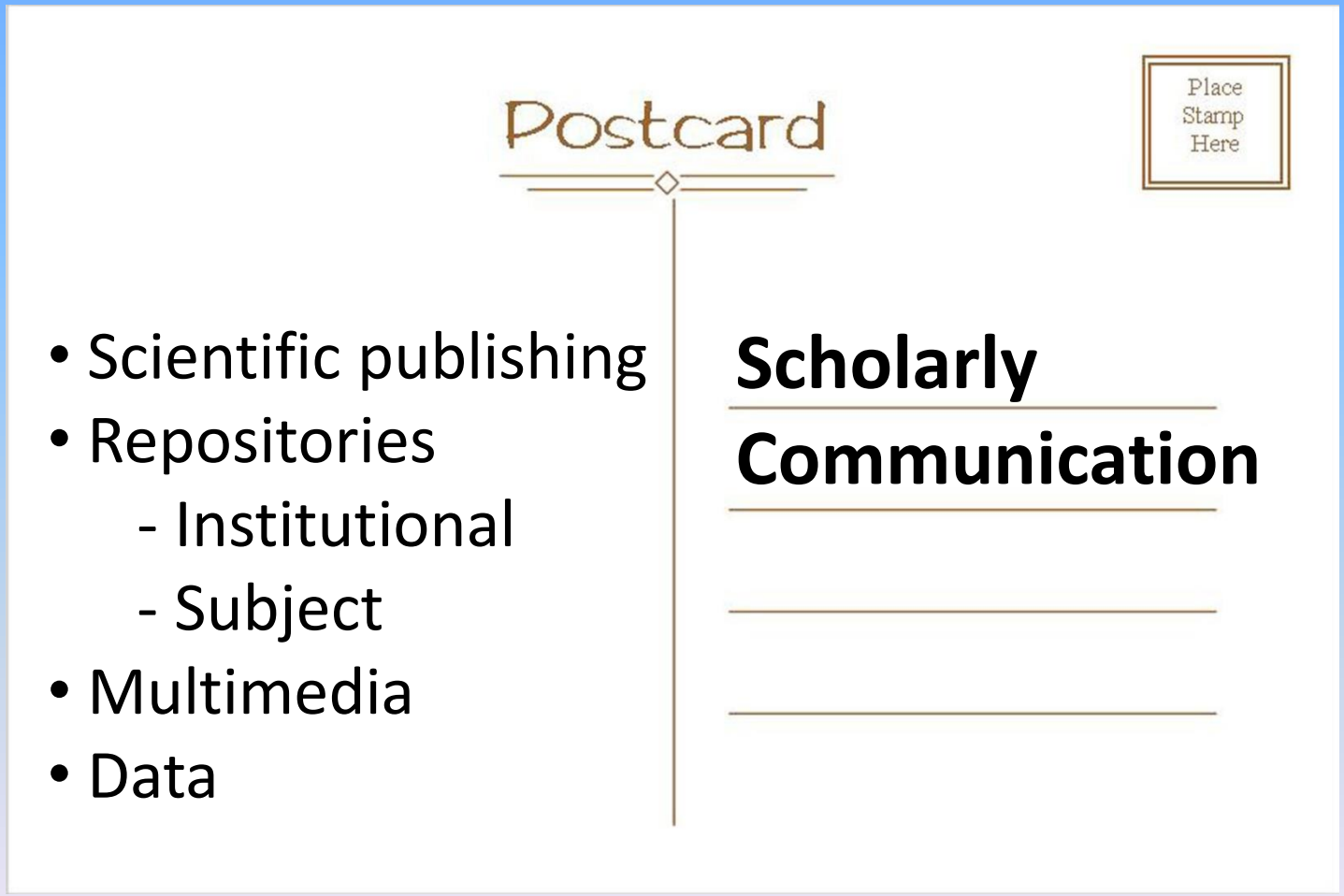


Image courtesy of University of Minnesota

# DESTINATIONS on the journey…



# DESTINATION:
# Scholarly Communication



# Scientific Publishing

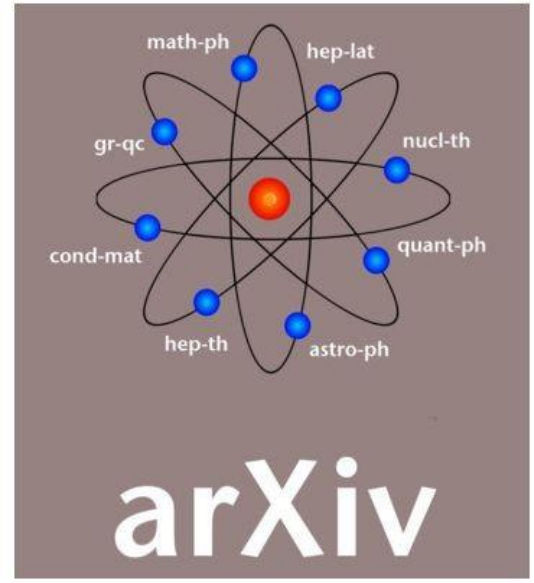
- Copyright
- Permissions and licensing

Zea Books

- Commercial publishing
- Nonprofit publishing
- Gratis (library-based) publishing
  - Monographs
  - Journals
  - Conference proceedings
  - Catalogs
  - Et al.

# Science Text Repositories

- Scholars' Bank: https://scholarsbank.uoregon.edu/xmlui/
- Biodiversity Heritage Library
- iDigBio
- ArXiv
- biorXiv
- Et al.




# Multimedia Database Services

- The multitude of format types, and system and storage requirements pose a challenge to managers
- Storage and display systems
  - OCLC ContentDM
  - Luna
  - Et al.

# Science Research Data

- Data repositories
  - Institutional https://library.uoregon.edu/datamanagement/repositories.html
  - Subject

    Dryad

    figshare

    GenBank

    Et al.

# Open Scholarship

Open scholarship, which encompasses open access, open data, open educational resources, and all other forms of openness in the scholarly and research environment, is changing how knowledge is created and shared. For research libraries, open scholarship offers opportunities for campus collaborations and new service roles.

—*Association of Research Libraries*

# Open Science

Open Science is the practice of science in such a way that others can collaborate and contribute, where research data, lab notes, and other research processes are freely available, under terms that enable reuse, redistribution, and reproduction of the research and its underlying data and methods.

—*Facilitate Open Science Training for European Research*

# Proprietary Science

- Biological taxonomy (priority naming)
- Engineering
- Biotechnology
- Business
- Pharmaceuticals
- Agricultural technology / Agribusiness
- Classified government information
- National security initiatives
- Personally-identifiable data

# DESTINATION: Science Literacy

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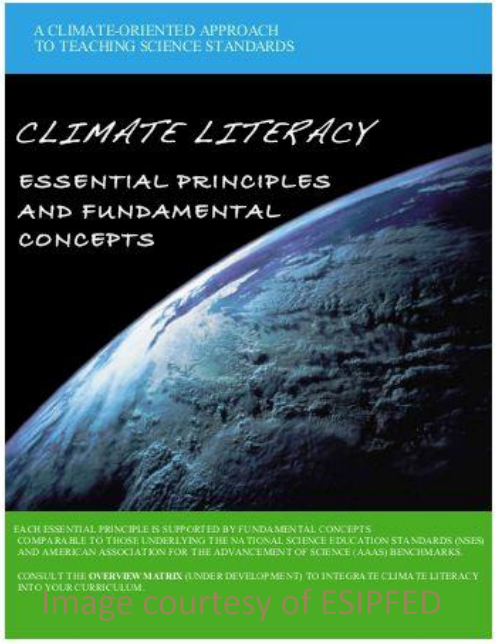



Image courtesy of ESIPFED

**Science Literacy**

# DESTINATION: Science Literacy

Cartoon caption:

Thanks to the Internet, it is now possible to be extremely well-informed and completely wrong at the same time!

— *Rightreason.org*

Science librarians have an important role to play in combating science illiteracy.

# Science Pedagogy

- Next Generation Science Standards (K-12)
  - Practices
  - Crosscutting concepts
  - Disciplinary core ideas
- Except in math, post secondary pedagogical best practices in the sciences are not yet widely adopted
- Science librarians can partner with faculty, discipline-based education research initiatives

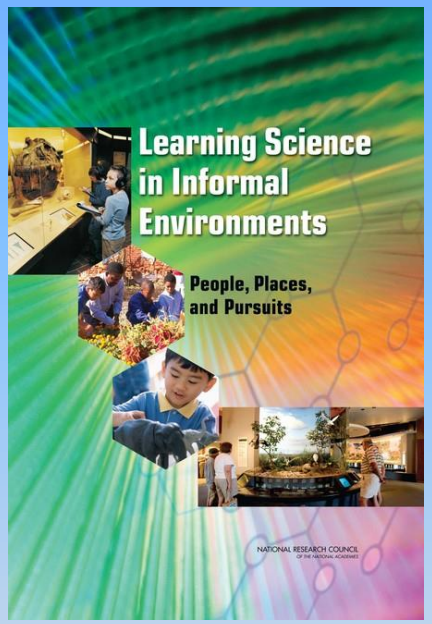
# Science Outreach

- LibGuides
- Instruction
- Library Web site
- Social media
- Conferences
- Informal science

Image courtesy of USC

# Informal Science Education

- Displays
- Use of mobile technology
- Popular science talks
- Science slams
- Science – Art collaborations
- Coloring, crafts
- Kids' activities — Curriculum collection
- Field trips



# DESTINATION: Inclusion

Postcard

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Image courtesy of the Inclusion Solution

**Inclusion**

# DESTINATION: Inclusion

- Public mission
- Science equity
  - Gender
  - Ethnicity/Race
  - Age
  - Educational attainment
  - Etc.
- Accessibility
- First Year Experience
- User Experience

Image courtesy of the Southern Coalition

# Science Advocacy

- Service learning
- Community events
- Invite civic leaders to visit the space to celebrate achievements


Image courtesy of City of New York

# Science Activism


Image courtesy of KVAL

MARCH FOR SCIENCE

EARTH DAY

APRIL 22, 2017

#marchforscience

EUGENE

# DESTINATION: Innovation

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**Innovation**

# Innovations

- Interactive applications
- Smart technology
- Advances in privacy protections
- Creative content creation and delivery
- Personalized customer service
- Greater community integration

# Funding

- Internal funding
- External funding

  (IMLS, NEH, NEA, CLIR, foundations, et al.)
- Donors / Fundraising
- Entrepreneurship


Image courtesy of gopetition.com

# Summary

- Libraries are a vital component in excellent post-secondary science education
- Now is the time to partner with colleagues in the academy to help establish post-secondary science pedagogical best practices
- Innovations in science education are facilitated by new learning spaces, such as the science commons

# A Roadmap for the Journey

The traveler that resolutely follows a rough and winding path will sooner reach the end of his journey than he that is always changing his direction, and wastes the hour of daylight in looking for smoother ground and shorter passages. —*Samuel Johnson*